CLAIMS:

1. A method of setting or adjusting a cardiac pacemaker in a patient diagnosed with cardiac asynchrony, which method comprises the steps of:

i) implanting cardiac pacing wires into at least the right ventricle and the left ventricle of the heart of the patient,

ii) continuously monitoring and recording the cardiac output, nominal stroke volume and/or arterial pressure of the patient on a beat-by-beat basis,

iii) continuously monitoring and recording the respiratory cycle of the patient, and

iv) adjusting the conduction delay between the electronic impulses to the cardiac pacing wires until a synchronization of respiratory changes with changes in the cardiac output, stroke volume or arterial pressure of the patient is obtained.

2. A method as claimed in claim 1 wherein a cardiac pacing wire is additionally implanted into the right atrium of the patient's heart.

3. A method as claimed in claim 1 or claim 2 wherein the arterial pressure of the patient is monitored by means of an arterial line and a pressure transducer.

4. A method as claimed in claim 1 or claim 2 wherein the nominal stroke volume is derived by a method comprises the steps of

(a) recording and storing the arterial blood pressure waveform of a patient from a blood pressure monitoring device over a period of time;

(b) subjecting the waveform obtained in step (a) to a non-linear transformation that corrects for the variation of the characteristics of the arterial system with pressure;

(c) subjecting the corrected waveform from step (b) to autocorrelation in order to derive the pulsatility and heart rate of the corrected waveform; and

(d) calculating the nominal stroke volume from the pulsatility.

5. A method as claimed in claim 4 wherein the transformation in step (b) is effected using a look up table with the mean of the date being found and substrated.

6. A method as claimed in claim 1 or claim 2 wherein the nominal stroke volume is derived by a method which comprises the steps of:

(e) recording and storing the arterial blood pressure waveform of a patient from a blood pressure monitoring device over a period of time;

(f) subtracting the mean of the waveform from step (e) and subjecting the data so obtained to autocorrelation;

(g) transforming the data from step (f) into data which relates to the pulsatility and heart rate of the waveform; and

(h) calculating the nominal stroke volume from the pulsatility.

7. A method as claimed in claim 6 wherein the transformation in step (f) is effected using a look up table, with the mean of the data then being subtracted.

8. A method as claimed in claim 1 or claim 2 wherein the nominal stroke volume is derived by a method which comprises the steps of:

(i) recording and storing the arterial blood pressure waveform of a patient from a blood pressure monitoring device over a period of time;

(j) subjecting the data obtained in step (i) to Fourier analysis in order to obtain the modulus of the first harmonic; and

(k) determining the nominal stroke volume from the modulus of the first harmonic obtained in step (j) and data relating to the arterial blood pressure and the heart rate.

9. A method as claimed in claim 1 or claim 2 wherein the nominal stroke volume is derived by a method which comprises the steps of:

(l) recording and storing the arterial blood pressure waveform of a patient from a blood pressure monitoring device over a period of time;

(m) subjecting the waveform obtained in step (l) to a non-linear transformation that corrects for the variation of the characteristics of the arterial system with pressure;

(n) subjecting the data obtained in step (n) to Fourier analysis in order to obtain the modulus of the first harmonic;

(o) determining the nominal stroke volume from the modulus of the first harmonic obtained in step (n) and data relating to the heart rate and optionally the arterial blood pressure.

10. A method as claimed in claim 9 wherein the transformation in step (m) is effected using a look up table, with the mean of the data then being subtracted.

11. A method as claimed in any one of the preceding claims wherein the respiratory cycle of the patient is monitored by means of computer analysis of the arterial waveform, or by means of a strain gauge placed around the patient's chest.

12. A method as claimed in any one of the preceding claims wherein the conduction delay between the individual electronic impulses to the different cardiac pacing wires is adjusted systematically using a pre-determined matrix.

13. A method as claimed in any one of the preceding claims wherein the cardiac output, nominal stroke volume and/or arterial pressure and the respiratory cycle of the patient are recorded and stored in an appropriately programmed computer and displayed on a display device integral with or connected to the computer.

14. A method as claimed in any one of the preceding claims wherein the pacing rate of the electronic impulses to the cardiac pacing wires may be varied.

15. A method as claimed in claim 14 wherein the pacing rate is varied between 80 and 100 beats per minute.

16. A method of adjusting a cardiac pacemaker having cardiac pacing wires implanted into at least the right ventricle and the left ventricle of the heart of a subject, which method comprises the steps of:

(x) continuously monitoring and recording the cardiac output, nominal stroke volume and/or arterial pressure of the subject on a beat-by-beat basis,

(xi) continuously monitoring and recording the respiratory cycle of the patient, and

(xii) adjusting the conduction delay between the electronic impulses to the cardiac pacing wires until a synchronization of respiratory changes with changes in the cardiac output, stroke volume or arterial pressure of the subject is obtained.

17. A method as claimed in claim 16 wherein the cardiac pacemaker includes a cardiac pacing wire implanted into the right atrium of the subject's heart.

18. A method as claimed in claim 16 or claim 17 wherein the nominal stroke volume is derived by a method as defined in any one of claims 4 to 9.

19. A method as claimed in any one of claims 16 to 18 where the respiratory cycle of the patient is monitored by means of computer analysis of the arterial waveform, or by means of a strain gauge placed around the patient's chest.

20. A method as claimed in any one of claims 16 to 19 wherein the conduction delay between the individual electronic impulses to the different cardiac pacing wires is adjusted systematically using a pre-determined matrix.

21. A method as claimed in any one of claims 16 to 20 wherein the cardiac output, nominal stroke volume and/or arterial pressure and the respiratory cycle of the patient are recorded and stored in an appropriately

programmed computer and displayed on a display device integral with or connected to the computer.

22. A method as claimed in any one of claims 16 to 21 wherein the pacing rate of the electronic impulses to the cardiac pacing wires may be varied.

23. A method as claimed in claim 22 wherein the pacing rate is varied between 80 and 100 beats per minute.

24. A method as claimed in any one of the preceding claims wherein when a synchronization of respiratory changes with changes in the cardiac output, stroke volume or arterial pressure of the patient is obtained, the optimal setting of the pacemaker is then determined by monitoring the stroke volume variation of the heart and selecting a pacemaker setting which provides an increased ventricle pre-load responsiveness.

25. An apparatus for setting or adjusting a cardiac pacemaker in a patient diagnosed with asynchrony and having cardiac pacing wires implanted into at least the right ventricle and the left ventricle, which apparatus comprises:

(A) means for continuously monitoring and recording the cardiac output, nominal stroke volume and/or arterial pressure of the patient;

(B) means for continuously monitoring and recording the respiratory cycle of the patient;

(C) means for adjusting the delay between the

electronic impulses to the pacing wires; and

(D) means for determining when a synchronization of the respiratory changes with changes in the cardiac output, stroke volume or arterial pressure is obtained.